Listing of Claims

1 (Currently Amended): A method of setting up a plurality of virtual circuits between a first end system and a second end system, said plurality of virtual circuits being set up on a network connecting said first end system to said second end system, each of said plurality of virtual circuits terminating at said first end system and said second end system, said method being performed in a device between said first end system and said second end system, said method comprising:

sending to said second end system a first signaling message requesting said plurality of virtual circuits to be set up.

2 (Original): The method of claim 1, wherein said first signaling message comprises a plurality of information elements, wherein a first information element is designed to request set up of a single virtual circuit comprised in said plurality of virtual circuits, and a second information element is designed to request set up of a second plurality of virtual circuits comprised in said plurality of virtual circuits, further comprising:

receiving an acceptance message indicating that only said single virtual circuit is possible to be provisioned if any of a plurality of switches in a connection path between said first end system and said second end system is designed not to support said plurality of virtual circuits.

3 (Original): The method of claim 2, wherein said second information element comprises a non-mandatory information element according to a specification, wherein non-mandatory information elements can be ignored by said plurality of switches according to said specification.

4 (Original): The method of claim 3, wherein said specification comprises one of user to network interface (UNI) and network to network interface (NNI).

5 (Original): The method of claim 1, further comprising:

receiving an acceptance message, said acceptance message indicating that a plurality of switches in a connection path between said first end system and said second end system have set up said plurality of virtual circuits.

6 (Original): The method of claim 5, wherein said plurality of switches accept said plurality of virtual circuits but immediately provision fewer than said plurality of virtual circuits, said method further comprising:

sending a second signaling message to activate at least one of a plurality of not-yet-provisioned virtual circuits comprised in said plurality of virtual circuits.

7 (Original): The method of claim 6, wherein said fewer than said plurality of virtual circuits corresponds to one virtual circuit such that only one virtual circuit is provisioned in response to said first signaling message.

8 (Original): The method of claim 5, wherein said plurality of virtual circuits is treated as a group of virtual circuits, wherein said first end system and said second end system support a plurality of groups including said group, said method further comprising maintaining a bundle structure associated with each of said plurality of groups, wherein said bundle structure stores information identifying the specific plurality of virtual circuits forming the corresponding group.

9 (Original): The method of claim 8, further comprising:

maintaining a plurality of call reference structures, wherein each of said plurality of call reference structures maintains the state of a call, wherein signaling messages related to each group are received on a corresponding call; and

maintaining a plurality of per-VC structures, wherein each per-VC structure stores information related to a plurality of call parameters accepted for a corresponding one of said plurality of virtual circuits.

10 (Original): The method of claim 9, wherein said sending, said receiving and each of said maintaining are performed in a switch contained in said connection path, said method further comprising:

maintaining a plurality of switch structures, wherein each of said plurality of switch structures stores a mapping of an identifier of each of said virtual circuit in inbound direction to another identifier of the virtual circuit in outbound direction;

mapping each identifier received in inbound direction to a corresponding identifier in outbound direction using said plurality of switch structures.

11 (Original): The method of claim 9, wherein said first end system comprises an edge router and wherein said method is performed in said first edge router, wherein said first signaling message contains a bundle identifier which is propagated without translation by each of said plurality of switches.

12 (Original): The method of claim 11, wherein each of said plurality of virtual circuits comprises a switched virtual circuit.

13 (Original): The method of claim 6, wherein said acceptance message and said first signaling message are both formed according to a common format, wherein said common format contains a field which indicates whether a message comprises said acceptance message or said first signaling message.

14 (Original): The method of claim 13, wherein said format allows a range of virtual circuits to be specified, said format further allowing a plurality of traffic parameters to be specified for all of said range of virtual circuits, wherein said plurality of parameters in said first signaling message specify the desired parameters and said plurality of parameters in said acceptance message specify the accepted parameters.

15 (Original): The method of claim 14, further comprising sending a release message requesting release of another range of virtual circuits.

16 (Currently Amended): A method of supporting the setting up of a plurality of virtual circuits between a first end system and a second end system, said plurality of virtual circuits being set up on a network connecting said first end system to said second end system, each of said plurality of virtual circuits terminating at said first end system and said second end system, said method being performed in a device, said method comprising:

receiving from said first end system a first signaling request requesting said plurality of virtual circuits to be set up.

17 (Original): The method of claim 16, wherein said method further comprises sending an acceptance message if said plurality of virtual circuits can be set up between said device and said second end system in response to said first signaling request alone.

18 (Original): The method of claim 17, wherein said method further comprises provisioning all of said plurality of virtual circuits before said sending.

19 (Original): The method of claim 17, further comprising provisioning fewer than said plurality of virtual circuits to said second end system before performing said sending.

20 (Original): The method of claim 19, further comprising:

receiving a second signaling message requesting activation of at least one of said not-yet-provisioned virtual circuits comprised in said plurality of virtual circuits;

completing provisioning of said at least one of said not-yet-provisioned virtual circuits; and

sending a completion message indicating said at least one of said not-yet-provisioned virtual circuits have been activated.

21 (Original): The method of claim 20, wherein said first signaling message contains a plurality of parameters related to a range of virtual circuits comprised in said plurality of virtual circuits, said method further comprising:

storing said plurality of parameters associated with said range of virtual circuits; and

provisioning said range of virtual circuits using said plurality of parameters,

whereby said plurality of parameters are transmitted only once for provisioning said range of virtual circuits.

22 (Original): The method of claim 21, wherein said first signaling request and said second signaling message are in received in the form of ATM cells.

23 (Original): The method of claim 22, wherein said device comprises one of said first end system, said second end system and a switch in the path of said plurality of virtual circuits connecting said first end system to said second end system.

24 (Original): A device for setting up a plurality of virtual circuits between a first end system and a second end system, said plurality of virtual circuits being set up on a network connecting said first end system to said second end system, said device comprising:

an outbound interface coupled to said network;

a message construction block coupled to said outbound interface; and

a call control logic for causing said message construction block to construct a first signaling message requesting said plurality of virtual circuits to be set up, and to send said first signaling message on said network to said second end system.

25 (Original): The device of claim 24, further comprising a signaling application programming interface (API), said signaling API receiving a request for a group of virtual circuits from an external application, and communicating said request to said call control logic, wherein said call control logic causes said first signaling message to be sent in response to said request.

26 (Original): The device of claim 25, wherein said outbound interface sends said first signaling message in the form of a plurality of asynchronous transfer mode (ATM) cells, said device further comprising:

a signaling ATM adaptation layer (SAAL) output block to encapsulate data generated by said message construction block to generate said first signaling message, said SAAL output block being coupled to said outbound interface.

27 (Original): The device of claim 24, wherein said first signaling message comprises a plurality of information elements, wherein a first information element is designed to request set up of a single virtual circuit comprised in said plurality of virtual circuits, and a second information element is designed to request set up of a second plurality of virtual circuits comprised in said plurality of virtual circuits, said device further comprising:

an inbound interface receiving on said network an acceptance message indicating that only said single virtual circuit is possible to be provisioned if any of a plurality of switches in a connection path between said first end system and said second end system is designed not to support said plurality of virtual circuits; and

a parser examining said acceptance message and forwarding said acceptance message to said call control logic.

28 (Original): The device of claim 27, wherein said second information element comprises a non-mandatory information element according to a specification, wherein non-mandatory information elements can be ignored by said plurality of switches according to said specification.

29 (Original): The device of claim 28, wherein said specification comprises one of user to network interface (UNI) and network to network interface (NNI).

30 (Original): The device of claim 24, further comprising an inbound interface receiving an acceptance message, said acceptance message indicating that a plurality of switches in a connection path between said first end system and said second end system have set up said plurality of virtual circuits.

31 (Original): The device of claim 30, wherein said plurality of switches accept said plurality of virtual circuits but immediately provision fewer than said plurality of virtual circuits, wherein said call control logic causes said message construction block to send a second signaling message to activate at least one of a plurality of not-yet-provisioned virtual circuits comprised in said plurality of virtual circuits.

32 (Original): The device of claim 30, wherein said plurality of virtual circuits is treated as a group of virtual circuits, wherein said first end system and said second end system support a plurality of groups including said group, said device further comprising a memory storing a bundle structure associated with each of said plurality of groups, wherein said bundle structure stores information identifying the specific plurality of virtual circuits forming the corresponding group.

33 (Original): The device of claim 32, wherein said memory further stores a plurality of call reference structures and a plurality of per-VC structures,

wherein each of said plurality of call reference structures maintains the state of a call, wherein signaling messages related to each group are received on a corresponding call, and

wherein each per-VC structure stores information related to a plurality of call parameters accepted for a corresponding one of said plurality of virtual circuits.

34 (Original): The device of claim 33, wherein said device comprises a switch in said connection path, said memory storing a plurality of switch structures, wherein each of said plurality of switch structures stores a mapping of an identifier of each of said virtual circuit in inbound direction to another identifier of the virtual circuit in outbound direction.

35 (Original): The device of claim 33, wherein said first end system comprises an edge router, wherein said first signaling message contains a bundle identifier which is propagated without translation by each of said plurality of switches.

36 (Original): The device of claim 30, wherein said acceptance message and said first signaling message are both formed according to a common format, wherein said common format contains a field which indicates whether a message comprises said acceptance message or said first signaling message.

37 (Original): The device of claim 36, wherein said format allows a range of virtual circuits to be specified, said format further allowing a plurality of traffic parameters to be specified for all of said range of virtual circuits, wherein said plurality of parameters in said first signaling message specify the desired parameters and said plurality of parameters in said acceptance message specify the accepted parameters.

38 (Currently Amended): An ~~device~~ apparatus for supporting the setting up of a plurality of virtual circuits between a first end system and a second end system, said plurality of virtual circuits being set up on a network connecting said first end system to said second end system, said plurality of virtual circuits terminating at said first end system and said second end system, said ~~device~~ apparatus comprising:

an in-bound interface receiving from said first end system a first signaling request requesting said plurality of virtual circuits to be set up.

39 (Currently Amended): The ~~device~~ apparatus of claim 38, wherein said ~~device~~ apparatus further comprises a call control logic receiving said first signaling message, said ~~device~~ apparatus sending an acceptance message if said plurality of virtual circuits can be set up between said ~~device~~ apparatus and said second end system in response to said first signaling request alone.

40 (Currently Amended): The ~~device~~ apparatus of claim 39, wherein said call control logic provisions all of said plurality of virtual circuits before sending said acceptance message.

41 (Currently Amended): The ~~device~~ apparatus of claim 39, wherein said call control logic provisions fewer than said plurality of virtual circuits to said second end system before sending said acceptance message.

42 (Currently Amended): The ~~device~~ apparatus of claim 41, wherein said inbound interface receives a second signaling message requesting activation of at least one of said not-yet-provisioned virtual circuits comprised in said plurality of virtual circuits, wherein said call control logic completes provisioning of said at least one of said not-yet-provisioned virtual circuits and then sends a completion message indicating said at least one of said not-yet-provisioned virtual circuits have been activated.

43 (Currently Amended): The ~~device~~ apparatus of claim 42, wherein said first signaling message contains a plurality of parameters related to a range of virtual circuits comprised in said plurality of virtual circuits, said ~~device~~ apparatus further comprising a memory storing said plurality of parameters associated with said range of virtual circuits, wherein said call control logic 550 provisions said range of virtual circuits using said plurality of parameters, whereby said plurality of parameters are transmitted only once for provisioning said range of virtual circuits.

44 (Currently Amended): The ~~device~~ apparatus of claim 43, wherein said ~~device~~ comprises one of said first end system, said second end system and a switch in the path of said plurality of virtual circuits connecting said first end system to said second end system.

45 (Currently Amended): A device for setting up a plurality of virtual circuits between a first end system and a second end system, said plurality of virtual circuits being set up on a network connecting said first end system to said second end system, said plurality of virtual circuits terminating at said first end system and said second end system, said device being located in a communication path between said first end system and said second end system, said device comprising:

means for sending to said second end system a first signaling message requesting said plurality of virtual circuits to be set up.

46 (Original): The device of claim 45, wherein said first signaling message comprises a plurality of information elements, wherein a first information element is designed to request set up of a single virtual circuit comprised in said plurality of virtual circuits, and a second information element is designed to request set up of a second plurality of virtual circuits comprised in said plurality of virtual circuits, said device further comprising:

means for receiving an acceptance message indicating that only said single virtual circuit is possible to be provisioned if any of a plurality of switches in a connection path between said first end system and said second end system is designed not to support said plurality of virtual circuits.

47 (Original): The device of claim 46, wherein said second informationelement comprises a non-mandatory information element according to a specification, wherein non-mandatory information elements can be ignored by said plurality of switches according to said specification.

48 (Original): The device of claim 47, wherein said specification comprises one of user to network interface (UNI) and network to network interface (NNI).

49 (Original): The device of claim 41, further comprising:

means for receiving an acceptance message, said acceptance message indicating that a plurality of switches in a connection path between said first end system and said second end system have set up said plurality of virtual circuits.

50 (Original): The device of claim 49, wherein said plurality of switches accept said plurality of virtual circuits but immediately provision fewer than said plurality of virtual circuits, said device further comprising:

means for sending a second signaling message to activate at least one of a plurality of not-yet-provisioned virtual circuits comprised in said plurality of virtual circuits.

51 (Original): The device of claim 50, wherein said plurality of virtual circuits is treated as a group of virtual circuits, wherein said first end system and said second end system support a plurality of groups including said group, said device further comprising means for storing a bundle structure associated with each of said plurality of groups, wherein said bundle structure stores information identifying the specific plurality of virtual circuits forming the corresponding group.

52 (Original): The device of claim 51, further comprising:

means for storing a plurality of call reference structures, wherein each of said plurality of call reference structures maintains the state of a call, wherein signaling messages related to each group are received on a corresponding call; and

means for a plurality of per-VC structures, wherein each per-VC structure stores information related to a plurality of call parameters accepted for a corresponding one of said plurality of virtual circuits.

53 (Currently Amended): A device for supporting the setting up of a plurality of virtual circuits between a first end system and a second end system, said plurality of virtual circuits being set up on a network connecting said first end system to said second end system, <u>each of said plurality of virtual circuits terminating at said first end system and said second end system,</u> said device comprising:

means for receiving from said first end system a first signaling request requesting said plurality of virtual circuits to be set up.

54 (Original): The device of claim 53, wherein said device further comprises means for sending an acceptance message if said plurality of virtual circuits can be set up between said device and said second end system in response to said first signaling request alone.

55 (Original): The device of claim 54, wherein said device further comprises means for provisioning all of said plurality of virtual circuits before sending said acceptance message.

56 (Original): The device of claim 54, further comprising means for provisioning fewer than said plurality of virtual circuits to said second end system before performing said sending.

57 (Original): The device of claim 56, further comprising:

means for receiving a second signaling message requesting activation of at least one of said not-yet-provisioned virtual circuits comprised in said plurality of virtual circuits;

means for completing provisioning of said at least one of said not-yet-provisioned virtual circuits; and

means for sending a completion message indicating said at least one of said not-yet-provisioned virtual circuits have been activated.

58 (Original): The device of claim 57, wherein said first signaling message contains a plurality of parameters related to a range of virtual circuits comprised in said plurality of virtual circuits, said device further comprising:

means for storing said plurality of parameters associated with said range of virtual circuits; and

means of provisioning said range of virtual circuits using said plurality of parameters,

whereby said plurality of parameters are transmitted only once for provisioning said range of virtual circuits.

59 (Currently Amended): A computer readable medium carrying one or more sequences of instructions for causing a device to set up a plurality of virtual circuits between a first end system and a second end system, said plurality of virtual circuits being set up on a network connecting said first end system to said second end system, each of said plurality of virtual circuits terminating at said first end system and said second end system, said

device being located in a communication path located between said first end system and said second end system, wherein execution of said one or more sequences of instructions by one or more processors contained in said device causes said one or more processors to perform the action of:

sending to said second end system a first signaling message requesting said plurality of virtual circuits to be set up.

60 (Original): The computer readable medium of claim 59, wherein said first signaling message comprises a plurality of information elements, wherein a first information element is designed to request set up of a single virtual circuit comprised in said plurality of virtual circuits, and a second information element is designed to request set up of a second plurality of virtual circuits comprised in said plurality of virtual circuits, further comprising:

receiving an acceptance message indicating that only said single virtual circuit is possible to be provisioned if any of a plurality of switches in a connection path between said first end system and said second end system is designed not to support said plurality of virtual circuits.

61 (Original): The computer readable medium of claim 60, wherein said second information element comprises a non-mandatory information element according to a specification, wherein non-mandatory information elements can be ignored by said plurality of switches according to said specification.

62 (Original): The computer readable medium of claim 59, further comprising:

receiving an acceptance message, said acceptance message indicating that a plurality of switches in a connection path between said first end system and said second end system have set up said plurality of virtual circuits.

63 (Original): The computer readable medium of claim 62, wherein said plurality of switches accept said plurality of virtual circuits but immediately provision fewer than said plurality of virtual circuits, further comprising:

sending a second signaling message to activate at least one of a plurality of not-yet-provisioned virtual circuits comprised in said plurality of virtual circuits.

64 (Original): The computer readable medium of claim 63, wherein said fewer than said plurality of virtual circuits corresponds to one virtual circuit such that only one virtual circuit is provisioned in response to said first signaling message.

65 (Original): The computer readable medium of claim 64, wherein said plurality of virtual circuits is treated as a group of virtual circuits, wherein said first end system and said second end system support a plurality of groups including said group, further comprising maintaining a bundle structure associated with each of said plurality of groups, wherein said bundle structure stores information identifying the specific plurality of virtual circuits forming the corresponding group.

66 (Original): The computer readable medium of claim 65, further comprising:

maintaining a plurality of call reference structures, wherein each of said plurality of call reference structures maintains the state of a call, wherein signaling messages related to each group are received on a corresponding call; and

maintaining a plurality of per-VC structures, wherein each per-VC structure stores information related to a plurality of call parameters accepted for a corresponding one of said plurality of virtual circuits.

67 (Original): The computer readable medium of claim 66, wherein said sending, said receiving and each of said maintaining are performed in a switch contained in said connection path, further comprising:

maintaining a plurality of switch structures, wherein each of said plurality of switch structures stores a mapping of an identifier of each of said virtual circuit in inbound direction to another identifier of the virtual circuit in outbound direction;

mapping each identifier received in inbound direction to a corresponding identifier in outbound direction using said plurality of switch structures.

68 (Original): The computer readable medium of claim 66, wherein said first end system comprises an edge router and wherein said actions are performed in said first edge router, wherein said first signaling message contains a bundle identifier which is propagated without translation by each of said plurality of switches.

69 (Original): The computer readable medium of claim 62, wherein said acceptance message and said first signaling message are both formed according to a common format, wherein said common format contains a field which indicates whether a message comprises said acceptance message or said first signaling message.

70 (Original): The computer readable medium of claim 69, wherein said format allows a range of virtual circuits to be specified, said format further allowing a plurality of traffic parameters to be specified for all of said range of virtual circuits, wherein said plurality of parameters in said first signaling message specify the desired parameters and said plurality of parameters in said acceptance message specify the accepted parameters.

71 (Original): The computer readable medium of claim 70, further comprising sending a release message requesting release of another range of virtual circuits.

72 (Currently Amended): A computer readable medium carrying one or more sequences of instructions for causing a device to support the setting up of a plurality of virtual circuits between a first end system and a second end system, said plurality of virtual circuits being set up on a network connecting said first end system to said second end system, <u>each of said plurality of virtual circuits terminating at said first end system and said second end system,</u> wherein execution of said one or more sequences of instructions by one or more processors contained in said device causes said one or more processors to perform the action of:

receiving from said first end system a first signaling request requesting said plurality of virtual circuits to be set up.

73 (Original): The computer readable medium of claim 72, further comprising sending an acceptance message if said plurality of virtual circuits can be set up between said device and said second end system in response to said first signaling request alone.

74 (Original): The computer readable medium of claim 73, further comprising provisioning all of said plurality of virtual circuits before said sending.

75 (Original): The computer readable medium of claim 73, further comprising provisioning fewer than said plurality of virtual circuits to said second end system before performing said sending.

76 (Original): The computer readable medium of claim 75, further comprising:

receiving a second signaling message requesting activation of at least one of said not-yet-provisioned virtual circuits comprised in said plurality of virtual circuits;

completing provisioning of said at least one of said not-yet-provisioned virtual circuits; and

sending a completion message indicating said at least one of said not-yet-provisioned virtual circuits have been activated.

77 (Original): The computer readable medium of claim 76, wherein said first signaling message contains a plurality of parameters related to a range of virtual circuits comprised in said plurality of virtual circuits, further comprising:

storing said plurality of parameters associated with said range of virtual circuits; and

provisioning said range of virtual circuits using said plurality of parameters,

whereby said plurality of parameters are transmitted only once for provisioning said range of virtual circuits.

78 (New): The method of claim 1, wherein each of said plurality of virtual circuits comprises a asynchronous transfer mode (ATM) virtual circuit provided between said first end system and said second end system.